

MOUNTING SYSTEMField of the Invention

The present invention relates to a mounting system.
5 The mounting system is particularly, but not exclusively, suitable for mounting of shelving.

Throughout the specification, the invention is described and defined with reference to the orientation for use where the mounting system has a supporting panel
10 which is disposed in a vertical orientation. This, however, should not be construed as limiting the invention to this orientation as the mounting system may be used in different orientations. Accordingly, reference to a particular orientation, such as "upper" and "lower" is to
15 be construed to encompass these other orientations.

Background to the Invention

One mounting system on the market is known as SLATWALL. This mounting system has a supporting panel,
20 which is usually 2400mm wide by 1200mm high by 18mm thick. The supporting panel is formed of custom wood which has cut out of it seven horizontal slots. Each slot has a rectangular entrance portion extending the length of the panel. Each entrance portion is about 10mm high and 4mm
25 deep. The entrance portion then opens out to a larger interior rectangular cavity which is about 30mm high and 10mm deep and arranged symmetrically relative to the aperture so equal parts of the interior rectangular cavity extend above and below the aperture. Seven aluminium
30 extrusions are received within respective ones of the seven slots in order to reinforce the slots. Brackets are then mounted within the slot in order to support shelving.

One problem with this existing system is that when the brackets are supporting shelving, the weight on them
35 tends to cause the bracket to bear on the extrusion in the region above the aperture. In turn, this tends to cause the reinforcing extrusion to bear on the portion of the

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supporting panel immediately above the entrance portion. This portion of the supporting panel is 10mm long and only 4mm thick and is at right angles to the roof of the interior rectangular cavity. Accordingly, force applied to this portion of the panel tends to cause the custom wood to break in the vicinity of where it joins the roof of the interior cavity and results in the reinforcing member and bracket pulling out of the supporting panel. A further problem is that the size of the rectangular cavity is substantial relative to the size of the panel which can lead to the supporting panel bending or bowing. Further, the size of the openings are so big that they detract from the appearance of the mounting system.

Accordingly, it would be advantageous to provide a mounting system which addresses at least one of these problems.

Summary of the Invention

Accordingly in a first aspect, the present invention provides a mounting system having:

a supporting panel having a cavity therein, the cavity having an aperture in a front face of the supporting panel, the cavity widening from the aperture to a hook receiving portion having upper and lower surfaces; and

a mount having a hook, the hook incorporating a distal and proximal portion and being shaped so that the mount may be fixed to the panel by locating the distal portion within the aperture and rotating the mount so that the hook passes the aperture and locates within the hook receiving portion, wherein to resist withdrawal of the hook from the cavity under the influence of a turning moment induced on the hook by a load applied to the mount, the distal and proximal portions are arranged to abut respective ones of the upper and lower surfaces and to become wedged between those surfaces as the hook moves across at least one of those surfaces under the influence

of the turning moment.

In a second aspect, the present invention provides a mounting system having:

5 a supporting panel having a cavity therein, the cavity having an aperture in a front face of said supporting panel, the cavity widening from the aperture to a hook receiving portion; and

10 a mount having a hook, the hook being shaped so that the mount may be fixed to the panel by locating a distal portion within the aperture and rotating the mount so that the hook passes the aperture and locates within the hook receiving portion with the distal portion abutting an upper surface of the cavity, wherein to resist withdrawal of the hook by the cavity on applying a load to the mount,
15 the distal portion is caused to be forced into engagement with the upper surface of the cavity.

In a preferred form of this aspect, the hook includes a proximal portion which is arranged to abut a lower surface of the cavity, wherein in resisting
20 withdrawal of the hook from the cavity, the hook becomes wedged between the roof and the lower surface.

A mounting system according to these aspects of the present invention have substantial practical benefits. By having an arrangement where the hook becomes wedged
25 between the upper and lower surfaces to resist its removal from the cavity, the hook is forced into compression causing the reaction loading to be distributed across regions of the supporting panel disposed both above and below the cavity. This substantially reduces the localised
30 loading effect which was present in the previous systems.

The inventor has found that by using the wedging action, it is possible to produce the supporting panel from custom wood or even particle board for use in retail shop fittings without requiring the need for any
35 reinforcing extrusion provided within the cavity. This not only substantially reduces the costs of manufacture but also allows much more flexible design of the mounting

system. For example, the panels may be curved. In addition, depending on any loading requirements, the supporting material may also be made from different materials such as corrugated cardboard or the like.

5 In one embodiment, on insertion of the hook into the cavity, the distal and proximal portions are arranged to abut the upper and lower surfaces so as to place the hook in compression. This arrangement prestresses the hook and thereby limits the play in the mount. It also provides a
10 better "feel" as the mount is placed in register within the hook receiving portion of the supporting panel.

In one form, the hook receiving portion of the cavity is shaped so that the lower surface extends upwardly in a direction towards the aperture. The
15 orientation of this surface provides at least part of the wedging action that is induced on the hook as it resists being withdrawn under the influence of the applied loading on the mount.

In one form, the hook is arranged to pivot about its
20 distal portion on locating the hook within the hook receiving portion. In a particular embodiment, the upper surface incorporates a recess that is configured to receive the distal portion of the hook. In this arrangement, an outer surface of the distal portion
25 engages a complementary shaped portion of the recess wall so as to facilitate pivoting of the hook about its distal portion when located in that recess.

In a particular embodiment, the hook is formed by a pair of arcuate portions which are joined together to
30 define a generally v-shaped hook. One of the pair of arcuate portions includes the distal portion of the hook, and the other arcuate portion includes the proximal portion.

In a particular embodiment, an outer surface of one
35 of the arcuate portions has a constant radius of curvature having the axis of radius disposed in the other arcuate portion. In a particular arrangement, the axis of the

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constant radius of curvature of the other arcuate portion (which includes the proximal portion) is arranged to be the point at which the hook pivots about its distal portion in installing the hook in the cavity. Furthermore, in a particular embodiment, the lower surface is also arcuate having a constant radius of curvature which is complementary to the outer surface of the arcuate portions.

The geometry of the above arrangement is such that installation of the hook is controlled.

Preferably, at its highest, the cavity is between 1.5 and 3 times as high as at the aperture and most preferably about 2.5 times as high.

Preferably, the cavity is formed by an elongate slot which defines an extended hook receiving portion adapted to receive a plurality of hooks of respective ones of a plurality of mounts.

Preferably, the panel has a plurality of substantially parallel elongate slots.

Alternatively, the mounting system includes a plurality of cavities spaced horizontally apart from one another when the panel is located in a substantially vertical plane.

Preferably, the height of the aperture is less than three times the thickness of the hook.

Preferably, the supporting panel has a plurality of rows of spaced apart cavities.

Preferably, the mount is part of a bracket. Preferably, the bracket includes a flange which locates flush against the support surface. In use on loading the bracket, it causes a turning moment to be induced about the lower edge of the flange. This turning moment is resisted by the hook in the cavity engaging the cavity walls.

In one embodiment described above, the hook is formed by a pair of arcuate portions which are joined together to define a generally v-shaped hook. Preferably,

the points defining the ends of the arcuate portions are disposed relative to one another such that if the points were joined by straight lines, the lines would define a substantially equilateral triangle.

5 Preferably, the hook receiving portion is formed in part by the cavity having a rear surface opposite the aperture, the rear surface having a complementary shape to the one of the arcuate portions which provides the hook end.

10 In a further aspect, the present invention relates to a mounting system having:

 a supporting panel having a cavity therein, the cavity having an aperture in a front face of the supporting panel, the cavity widening from the aperture to
15 a hook receiving portion having an upper surface incorporating a recess disposed inwardly from the aperture, and a lower surface which extends upwardly in a direction toward the aperture; and

 a mount having a hook, the hook incorporating a
20 distal and proximal portions and being shaped so that the mount may be fixed to the panel by locating the distal portion within the aperture so that it locates within the recess and thereafter rotates about its distal portion to be fully received within the cavity, wherein the recess
25 has a wall surface that is shaped to complement an outer surface of the distal portion so that the hook is able to pivot about its distal portion when locating the hook in the hook receiving portion.

 In a preferred form, the lower surface is arcuate
30 having a constant radius of curvature having an axis substantially coincident with the axis about which the distal portion pivots.

 In a preferred form, the proximal portion of the hook incorporates an arcuate outer surface which has a
35 constant radius of curvature having its axis disposed at the distal portion.

 In a further aspect, the invention relates to a .

supporting panel for use in a mounting system as described in any form above. In yet a further aspect the invention relates to a mount for use in a mounting system as disclosed in any form above.

5 In yet a further aspect the invention relates to a supporting panel for a mounting system, the supporting panel incorporating a cavity arranged to receive a hook for a mount, the cavity having an aperture in a front face of the supporting panel, and widening from the aperture to
10 a hook receiving portion, wherein the upper surface of the cavity includes a recess spaced from the aperture, and a lower surface of the cavity incorporates an arcuate surface having a constant radius of curvature having its axis disposed generally in the recess.

15 In yet a further aspect the invention relates to a mount for a mounting system, the mount having a hook formed by a pair of arcuate portions which define a generally v-shaped hook, wherein one of the pair of arcuate portions includes a distal portion of the hook,
20 and the other arcuate portion includes a proximal portion of the hook, the proximal portion having an outer surface having a constant radius of curvature having its axis disposed at the distal portion.

25 Brief Description of the Invention

It is convenient to hereinafter describe the embodiments of the present invention with reference to the accompanying drawings. It is to be appreciated that the particularity of the drawings and the related description
30 is to be understood as not superseding the generality of the preceding broad description:

In the drawings:

Figure 1 is a cross-sectional view showing a prior art mounting system;

35 Figure 2 shows a supporting panel of the present invention having a plurality of slots;

Figure 3 shows a supporting panel of the present

invention having a plurality of holes;

Figure 4 shows a mount for use in the first preferred embodiment;

Figure 5 shows a bracket including a mount of the first preferred embodiment;

Figure 6 is a cross-sectional view of the slot or holes of the first preferred embodiment;

Figure 7 is a cross-sectional view showing the hook of the mount;

Figure 8 shows the mount being inserted into the hook receiving portion;

Figure 9 shows the mount partially inserted into the hook receiving portion;

Figure 10 shows the hook received within the hook receiving portion;

Figure 11 is a cross-sectional view of an alternative arrangement of the hook receiving portion; and

Figure 12 is a cross-sectional view of a mounting system of a second preferred embodiment.

Description of the Preferred Embodiment

A prior art mounting system which is known as SLATWALL and is available from AUSTRALIAN SLATWALL INDUSTRIES PTY LTD. The prior art mounting system has a supporting panel which has seven horizontal slots therein. Each slot extends the length of the panel. Figure 1 is a cross-sectional view of one of these slots. Each slot consists of an opening aperture 101 which opens out to a larger interior rectangular hole 102. Typically, the supporting panel is formed of 18mm thick custom wood, in which case the aperture 101 is about 10mm high and extends 4mm deep into the custom wood before opening to the wider rectangular hole which is about 10mm deep and 30mm high. A reinforcing extrusion 103 is fitted into the slot and as shown in Figure 1 tends to fit slightly loosely within the slot.

In use, a mount 104 of a bracket is placed within

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the slot. In use the mount will generally support a bracket which in turn will support shelving. When force is applied to the mount 104 by weight on the bracket it tends to cause the end 106 of the mount to bear on the portion 107 of the reinforcing extrusion 103 located above the aperture 101. This in turn causes the reinforcing portion to bear on the flange 105 located above the aperture 101. This, in turn tends to cause the flange to break and the reinforcing extrusion 103 and bracket to pull out of the supporting panel.

Further, the relative size of each of the slots consisting of aperture 101 and rectangular hole 102 is such that it tends to weaken the supporting panel and causing it to bend or bow.

Referring now to Figure 2, there is shown a supporting panel 1A having a plurality of cavities in the form of elongate slots 2. An alternative supporting panel 1B is shown in Figure 3 which has a plurality of cavities in the form of rows of horizontally spaced apart holes 3. Figures 2 and 3 are used for illustrative purposes to show the general layout of the slots or holes and any dimensions indicated in these drawings are purely indicative. Supporting panels 1A, 1B represent alternative choices to a user of the mounting system who may prefer the aesthetics of one design over the other. Irrespective of whether the panel incorporates slots 2 or holes 3, the same mounts can be used.

Referring now to Figure 4, there is shown a mount 4 of a first embodiment. The mount 4 consists of a generally v-shaped hook 5 and a flange 6 which in the first preferred embodiment is designed to rest flat against the front face 16 of the supporting panel 1. In other embodiments, the width of the connecting portion 7 which connects the hook to the flange may be increased in order to accommodate, for example, a piece of glass between the front face 16 of the panel 1 and the flange 6.

The mount 4 forms part of a bracket as shown in

Figure 5. Several of these brackets 8 can be located either at spaced apart locations within slots 2 of panel 1A or within horizontally spaced apart holes 3 of panel 1B in order to support a shelf.

5 Figures 6 and 7 are cross-sectional views of the slots/holes and hook respectively. With respect to Figure 7 and following Figures 8 and 10 it is noted that the entirety of flange 6 of the mount is not shown for convenience of illustration.

10 Referring to Figure 7, it will be apparent that the hook 5 is generally v-shaped and has a first arcuate portion 9A and a second arcuate portion 9B. With this arrangement, an outer end 15B of the arcuate portion 9A forms a distal portion of the hook, whereas the second
15 arcuate portion 9B forms a proximal portion of the hook. The hook 5 is made from sheet metal, such as mild steel or stainless steel. The arcuate portions are designed to flex and have a thickness of about 1.5mm if made from mild steel or about 1.2mm if made from stainless steel.

20 The ends of the arcuate portions 15 are disposed relative to one another such that if they were joined by lines they would form a substantially equilateral triangle. In addition, the outer surface 34 of the arcuate portion 9A and the outer surface 35 of the second
25 arcuate portion 9B, have a constant radius of curvature. Furthermore, the axis of the radius of curvature of the surface 35 lies at the distal portion 15B whereas the axis of curvature of the outer surface 34 of the arcuate
30 portion 9A is in the vicinity of the juncture 15C between the second arcuate portion 9B and the flange 6.

 Figures 6, and 8 to 10 illustrates a cross-section of the panel incorporating an elongate slot 2 in cross-section. The panel is made from 18mm custom board and the slot cavity extends inwardly approximately 10mm. The
35 cavity 2 widens from the aperture 10 to a hook receiving portion 11 which has upper and lower surfaces (36, 37 respectively). In the illustrated form, the cavity is

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symmetrical so that the supporting panel does not have a specific "up" orientation. However it will be appreciated that the cross-section does not need to be formed in a symmetrical manner in order to receive the hook of the mount, as will be discussed in more detail below.

In the illustrated embodiment, each of the surfaces 36, 37 include arcuate portions 38 which are inclined inwardly towards the aperture 10. Each of the upper and lower surfaces 36, 37 also includes a recessed portion 39. These recessed portions include a shoulder portion 40 which faces away from the aperture 10 and a curved bridging portion 41 which extends from the respective shoulder portions to the rear surface 13 of the cavity.

The cavity 2 is shaped to receive and allow the hook 5 to pass the aperture 10 of the cavity and locate within the hook receiving portion 11 of the cavity while also allowing the aperture 10 to be relatively narrow. For example, where the hook arcuate portions 9 are approximately 1.5mm thick it is possible to pass the hook through an aperture which is about 4mm high. Thus, the height of the aperture can be less than three times the thickness of the hook.

The process of locating the hook 5 within the cavity 2 is best illustrated in Figures 8 to 10.

Turning firstly to Figure 8, the end 15B of the hook 5 is first located within the aperture 10 and into the hook receiving portion 11. At that time, the mount 4 is rotated downwardly such that the distal portion of the hook 5 locates within the recessed portion 39 with the hook end 15B bearing against the bridging portion 41. When located in this position, the outer surface 35 of the proximal portion of the hook 5 is caused to engage the arcuate portion 38 of the lower bearing surface 37. The surface 38 is shaped to complement the shape of the bearing surface 35 and has a constant radius of curvature which has its axis disposed on the surface 41 of the recess 39 in the upper surface 36. With this arrangement,

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the hook is able to pivot about its upper end 15B which allows the hook to be guided into a fully engaged position as illustrated in Figure 10 where the arcuate portion 9A bears against the rear surface 13.

5 A particular feature of the above arrangement is that this guided action of location of the hook within the cavity 11 is such that it inhibits the hook damaging the outer edges 42 of the aperture 10. In addition, the arcuate portions 9A are designed to be slightly oversized
10 so that when the hook 5 is located within the hook receiving portion 11, it is caused to be compressed between the bearing surface 38 and the bridging surface 41. This arrangement prestresses the hook and thereby limits the play in the mount. It also provides a better
15 feel as the mount is placed in register with the cavity receiving portion of the supporting panel.

In use, when weight is applied to the bracket 8, it tends to induce a turning moment as the bracket tries to pivot about the bottom 43 of the flange 46 (see Figure 4).
20 This induced turning moment biases the hook 5 to be forced out of the hook receiving portion 11 in a direction illustrated by the arrow P in Figure 10.

This induced turning moment is resisted by the engagement of the hook 5 within the hook receiving portion
25 11. Specifically, this turning moment is resisted by the engagement of the hook end 15B with the bridging portion 41 and by engagement of the outer surface 35 with the bearing surface 38. Because of the geometry of both the cavity and the hook 5, the induced turning moment 9 causes
30 the arcuate portion 9B to try to ride over the surface 38. This causes the end 15B of the hook to be driven into tighter engagement with the roof portion 41 thereby placing the hook 5 in compression and distributing the reactive force on both a portion 1C of the panel disposed
35 above the slot and a lower portion 1B of the supporting panel 1 disposed below the slot. As a result, these reactive forces are distributed more evenly across the

supporting panel thereby minimising concentration of stresses in the panel 1.

By being able to distribute the load across both the regions 1C and 1D, the prospects of the panel breaking is greatly reduced. As such, the inventor has found that when the supporting panels are made from custom wood using the dimensions of the preferred embodiment they have sufficient strength for most retail applications without requiring the need for any separate reinforcing extrusion as in the prior art.

The following are the results of tests conducted by the applicant. In the test conditions two brackets were placed at 600mm centres and inserted in the cavity on 18mm MDF (custom wood). A shelf was located over the brackets and a weight W was applied to the shelf and evenly distributed over that shelf.

Different brackets were tested with A being the length of bracket, B being the length of back-plate, C the width of the back-plate and W being the vertical load of near breaking point.

metres			W kg
A	B	C	2x Brackets
0.35	0.11	0.06	180
0.3	0.11	0.06	210
0.25	0.11	0.06	252
0.2	0.11	0.06	315
0.15	0.11	0.06	420
0.35	0.078	0.06	128
0.30	0.078	0.06	149
0.25	0.078	0.06	179
0.20	0.078	0.06	223
0.15	0.078	0.06	298
0.35	0.078	0.05	106
0.30	0.078	0.05	124
0.25	0.078	0.05	149

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0.20	0.078	0.05	186
0.15	0.078	0.05	248
0.35	0.05	0.04	55
0.30	0.05	0.04	64
0.25	0.05	0.04	76
0.20	0.05	0.04	95
0.15	0.05	0.04	127

The test results show that the mounting system is able to accommodate loading, which is clearly beyond that usually experienced in retail applications.

5 A variation on the configuration of the cavity is illustrated in Figure 11. The cavity 3 used in Figure 11 is typically incorporated where the cavity is formed as a plurality of rows of horizontally spaced apart holes 3 as best illustrated in Figure 3. In this arrangement, the
10 cavity 3 is designed to extend to the rear face 45 of the supporting panel 1. As a result, a major portion of the rear surface 13 is removed to provide an enlarged aperture 46 which allows access to a routing tool to form the holes. The formation of the aperture 46 does not
15 substantially affect the performance of the mounting system to resist the induced turning moment as the bearing surfaces on which the hook 5 engages remain intact.

The advantage of providing the arrangement in Figure 11 is that by enabling the routing tool to be inserted
20 from the rear face 45, the aperture 10 of the slots 3 can be uniform. In an arrangement where the slots are discontinuous, if the tool was inserted from the front face 16 then the aperture slots would have dumbbell appearance with the enlarged edge being formed to allow
25 withdrawal of the tool. A further advantage is that the shank of the routing tool is not limited to the size of the front aperture 10 as is the case when the tool is inserted from that front face.

It will be apparent to persons skilled in the art
30 that various modifications may be made to the present

invention without departing from the scope of the invention. One such alternate embodiment is illustrated in Figure 12. The hook 25 is part of a mount 26 which supports bracket 28. Aperture 20 widens gradually to a wider hook receiving portion 21 which is about 2.5 times as high as the aperture. The hook 25 is of more conventional shape than the hook of the first preferred embodiment but still bears on an upper portion 32 of the hook receiving portion 21.

It will be apparent to persons skilled in the art that the upper portion 32 in this case is angled and hence that, the bearing surface on which the hook end bears does not need to be perpendicular to the front face 16 of the board. As the hook receiving portion widens gradually from the aperture 20, it means that the force required to cause failure of the panel must be much more substantial than in the prior art even if some of the force applied by the end of hook 25 is applied in a direction towards the front face 16 of the board 1.

Other variations will be apparent to persons skilled in the art, for example, the hook of each mount does not need to be continuous and could be formed by a plurality of spaced hook portions. Further, while it is preferred that the aperture be kept as narrow, in some applications a narrow aperture will not be essential and the ratio of the height of the aperture to the highest portion of the cavity can be in the range of approximately 1.4-4:1 but more preferably in the range of 1.5-3:1.

It will be apparent to persons skilled in the art that they may make various variations to the mounting systems of the first and second embodiments without departing from the scope of the present invention. Such variations are considered to be within the scope of the invention described herein.